

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of) FOR: TUNABLE ISOLATOR
Inventor: TONCICH, Stanley S.) Group Art Unit: 2817
Application No.: 10/077,654) Examiner: JONES, Stephen E.
Filed: February 14, 2002) Attorney Docket No.: UTL 00161
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AMENDMENT AND RESPONSE

Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Attention: Examiner

Dear Sir:

This amendment and response is submitted in response to the Office Action dated February 6, 2006 (hereinafter "the Office Action"), in the above-referenced patent application. This response is submitted within a one (1) month extension of the shortened statutory period for reply, and Applicant requests an extension of the period for filing a reply in the above-identified application under the provisions of 37 CFR 1.136(a). The appropriate extension fee is filed herewith.

Please enter the following amendments and consider the following remarks.

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks begin on page 7 of this paper.

IN THE CLAIMS:

This listing of claims will replace all prior versions, and listing, of claims in the application:

List of All Pending Claims

1. (currently amended) A tunable isolator circuit comprising:

an isolator comprising an input port, an output port and an isolation port coupled to a ground;

an isolation matching circuit coupled to the isolation port of the isolator, the isolation circuit comprising:

a first tunable component coupled between the isolation port and a first connection point;

a second tunable component coupled between the first connection point and the ground;

a resistive element coupled between the first connection point and the ground; and

an input matching circuit having a first signal port coupled to the input port of the isolator and a second signal port coupled to an electrical component, the input matching circuit comprising:

a signal path from the first signal port to the second signal port; and

a first ferro-electric tunable component coupled between the first signal port and the second signal port along the signal path, wherein the first ferro-electric tunable component is responsive to a control signal for adjusting an impedance of the input matching circuit.

2. (previously presented) The tunable isolator circuit of claim 1, wherein the first ferro-electric tunable component comprises a ferro-electric tunable capacitor.

3. (canceled)

4. (previously presented) The tunable isolator circuit of claim 1, wherein the input matching circuit matches impedances between the isolator and the electronic component, wherein the electronic component is a power amplifier.
5. (previously presented) The tunable isolator circuit of claim 1, wherein the input matching circuit further comprises a second ferro-electric tunable component coupled between the signal path and an electrical ground.
6. (previously presented) The tunable isolator circuit of claim 5, wherein the second ferro-electric tunable component comprises a tunable ferro-electric capacitor.
7. (previously presented) The tunable isolator circuit of claim 1, further comprising:
an output matching circuit having a third signal port coupled to the output port of the isolator and a fourth signal port coupled to a second electrical component, the output matching circuit comprising:
the signal path from the third signal port to the fourth signal port; and
a third ferro-electric tunable component coupled between the third signal port and the fourth signal port along the signal path, wherein the third circuit ferro-electric tunable component is responsive to a second control signal for adjusting the impedance of the output matching circuit.
8. (previously presented) The tunable isolator circuit of claim 1, wherein the input matching circuit is a power amplifier-to-isolator matching circuit coupled to the output port of a power amplifier and to the input port of the isolator.

9. (previously presented) The tunable isolator circuit of claim 7, wherein the output matching circuit further comprises a fourth ferro-electric tunable component coupled between the signal path and an electrical ground.
10. (previously presented) The tunable isolator circuit of claim 9, wherein the fourth ferro-electric tunable component comprises a tunable ferro-electric capacitor.
11. (previously presented) The tunable isolator circuit of claim 1, wherein the isolation matching circuit is coupled between an electrical ground and the isolation port, and wherein the isolation matching circuit comprises an isolation circuit ferro-electric tunable component.
12. (previously presented) The tunable isolator circuit of claim 11, wherein the isolation circuit ferro-electric tunable component comprises a ferro-electric tunable capacitor.
13. (previously presented) The tunable isolator circuit of claim 7, wherein the output matching circuit matches a natural output impedance of the isolator to a natural input impedance of the second electrical component.
14. (previously presented) The tunable isolator circuit of claim 13, wherein the second electrical component is a duplexer, and wherein the output matching circuit matches from about 12.5 ohms at the isolator output port to about 12.5 ohms at a duplexer input port.
15. (previously presented) The tunable isolator circuit of claim 8, wherein the input matching circuit matches a natural output impedance of the power amplifier to a natural input impedance of the isolator.
16. (previously presented) The tunable isolator circuit of claim 15, wherein the input

matching circuit matches from about 2 ohms at a power amplifier output port to about 12.5 ohms at the isolator input port.

17. (previously presented) The tunable isolator circuit of claim 7, wherein the output matching circuit matches a natural output impedance of the isolator to a natural input impedance of the second electrical component coupled to the output port of the isolator, and wherein the input matching circuit matches a natural output impedance of the power amplifier to a natural input impedance of the isolator.

18. (canceled)

19. (canceled)

20. (currently amended) A tunable isolator circuit comprising:

an isolator comprising an input port, an output port and an isolation port coupled to a ground;

~~an-isolation-matching-circuit-coupled-to-the-isolation-port-of-the-isolator-and comprising-at-least-one-ferro-electric-tunable-component;~~

an input matching circuit having a first signal port coupled to the input port of the isolator and a second signal port coupled to an electrical component, the input matching circuit comprising:

a signal path from the first signal port to the second signal port; and
a first ferro-electric tunable component coupled between the first signal port and the second signal port along the signal path, wherein the first ferro-electric tunable component is responsive to a control signal for adjusting the impedance of the input matching circuit; and

an output matching circuit having a third signal port coupled to the output port of the isolator and a fourth signal port coupled to a second electrical component, the output matching circuit comprising:

the signal path from the third signal port to the forth signal port; and
a second ferro-electric tunable component coupled between the third
signal port and the fourth signal port along the signal path, wherein
the second circuit ferro-electric tunable component is responsive to
a second control signal for adjusting the impedance of the output
matching circuit; and

an isolation circuit coupled to the isolation port of the isolator comprising:

a first isolation circuit tunable component coupled between the isolation
port and a first connection point;
a second isolation circuit tunable component coupled between the first
connection point and the ground;
a resistive element coupled between the first connection point and the
ground.

21. (new) The tunable isolator circuit of claim 20, wherein at least one of the first isolation circuit tunable component and the second isolation circuit tunable component comprises a tunable ferro-electric element.

22. (new) The tunable isolator circuit of claim 1, wherein at least one of the first tunable component and the second tunable component comprises a tunable ferro-electric element.

REMARKS

The present amendment is in response to the Office Action where the Examiner has rejected claims 1, 2 and 4-17 and 20, which includes two (2) independent claims 1 and 20. The Examiner considered Applicant's arguments persuasive with respect to the prior office action rejections. However, new grounds of rejection are made in view of the Bernard reference US4236125. By the present amendment, independent claims 1 and 20 are amended, and claims 21 and 22 are added for a total of nineteen (19) claims including the two independent claims.

A. Claim Rejections under 35 USC 103(a)

The Examiner rejects all of the pending claims as being unpatentable over Bernard (US4236125) in view of Nakamichi (EP0909024A2) or as being unpatentable over Bernard and Nakamichi in further view of Makino (US5945887). The Simmons (US3676803) reference was cited in a previous Office Action. In response, Applicant amends independent claims 1 and 20 to more precisely claim the embodiment of the isolator circuit as illustrated in Figure 5 of the specification.

The Examiner has cited a number of issued patents disclosing various configurations of isolator circuits. Applicant asserts that specific constructions of isolator circuits are patentable as illustrated by the number of patents that have issued that are drawn to isolator circuit configurations. As such, the tunable isolator circuits as claimed by Applicant in independent claims 1 and 20 are not taught by any of the cited (and previously cited) references, alone or in combination.

Specifically, Applicant claims in independent claim 1, among other things, "an isolation circuit coupled to the isolation port of the isolator, the isolation circuit comprising: a first tunable component coupled between the isolation port and a first connection point; a second tunable component coupled between the first connection point and the ground; a resistive element coupled between the first connection point

and the ground."

Similarly Applicant claims in independent claim 20, inter alia, "an isolation circuit coupled to the isolation port of the isolator comprising: a first isolation circuit tunable component coupled between the isolation port and a first connection point; a second isolation circuit tunable component coupled between the first connection point and the ground; a resistive element coupled between the first connection point and the ground."

Applicant asserts that the patents to Bernard, Makino, Simmons and Nakamichi do not teach isolator circuits which can be considered alone or in combination to arrive at Applicant's claimed invention without the use of impermissible hindsight. In Figure 1 of the Makino patent, a resistive element, a capacitive element and an inductive element are shown in parallel to ground on a third port. However, none of these elements are tunable, and the "first tunable component coupled between the isolation port and a first connection point" as claimed by Applicant is not taught or suggested. Bernard does not cure this deficiency, among others, as a similar port path of Figure 5 illustrates a capacitive element in series with a parasitic inductance. Similarly, Simmons does not cure this basic deficiency. In Figure 2, Simons illustrates capacitors coupled to ground through diodes. Also, Nakamichi does not teach or suggest isolator circuit configurations and thus does not cure this basic deficiency. Thus, the configurations from these references, alone or in combination, do not result in the claimed invention. Therefore, the inventions claimed by Applicant in independent claims 1 and 20 are patentable over the cited art. The remaining claims are dependent upon patentable base claims. As such, Applicant respectfully requests that the Examiner issue a notice of allowance for the isolator circuit constructions as claimed by Applicant.

B. Conclusion

Applicant asserts that claims 1, 2, 4-17 and 20-22 are now patentable over the cited art under 35 U.S.C. 103(a) as discussed above. Thus, Applicant respectfully requests that the Examiner issue a notice of allowance for all of the now pending claims.

The fees for a one (1) month extension of time is filed herewith by EFS. The Director is authorized to charge any additional fee(s) or any underpayment of fee(s) or credit any overpayment(s) to Deposit Account No. 50-3001 of Kyocera Wireless Corp.

Should the Examiner believe that prosecution of this application might be expedited by further discussion of the issues, he is invited to telephone the attorney for Applicant at the telephone number listed below.

Respectfully submitted,

By: 
Kathleen L. Connell
Attorney for Applicant
Registration No. 45,344

Dated: June 6, 2006

KYOCERA WIRELESS CORPORATION
10300 Campus Point Drive
San Diego, California 92121

Telephone: (858) 882-2169
Facsimile: (619) 882-3650
Attorney Docket No.: UTL 00161